

GREEN ROOF ADVISORY GROUP

Report to Austin City Council

September 2010

Please find attached hard-copy excerpts from the Green Roof Advisory Group (GRAG) Report to Austin City Council for your review. The full report and appendices are very large, so we have included the following elements here:

1. Cover Page
2. Table of Contents
3. Executive Summary
4. Project Profiles (6 sheets)
5. Five Year Plan
6. Appendix D

The entire report can be found at the following website:

<http://www.ci.austin.tx.us/council/place1/>



"Green Roofs represent an elegant opportunity to simultaneously mitigate environmental problems and create immediate life-enhancing value."

Leslie Hoffman
Executive Director, Earth Pledge

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Executive Summary

CHARGE AND PROCESS

On August 27, 2009, Austin City Council charged the Green Roof Advisory Group (GRAG) to work with City staff to explore the feasibility of offering energy and stormwater credits and other incentives, based on performance, to encourage the creation of green roofs in the City. GRAG produced a policy document that included recommendations regarding those credits and incentives that would be appropriate for promoting green roofs in Austin. The stakeholder group was drawn from the fields of design, development, and green building and includes input from local green roof organizations and the Lady Bird Johnson Wildflower Center.

In order to accomplish these goals, GRAG established monthly meetings to occur from August 2009 to October 2010, formed separate committees to focus on specific green roof topics, and assisted staff in formulating a framework for interdepartmental review. We worked extensively with staff from the Watershed Protection Department; Austin Energy Green Building; and the Austin Climate Protection Program. The staff engaged other departments such as Planning and Development Review, Parks and Recreation Department, Public Works, and the Austin Water Utility. Through joint, collaborative efforts of staff and the stakeholder group, GRAG was able to assess the value green roofs within City of Austin policy, initiate discussions on best practices for green roofs in Austin, and develop a Five-Year Policy Implementation Plan.

ADVISORY GROUP EFFORTS

GRAG stakeholders and staff have engaged in and accomplished the following:

- Developed consensus on the public and private benefits of green roofs as a component of green infrastructure, including improved air quality, stormwater abatement, urban heat island mitigation, open space, wildlife habitat, and others.
- Completed a review of green roof incentive and credit policies of other cities in North America.

- Established a database of green roofs in Austin.
- Documented existing City of Austin policies and incentives which encourage green roofs.
- Analyzed potential policies that could be developed to encourage green roofs.
- Developed proposals to integrate green roofs into departmental program efforts.
- Advocated for green roofs as a Public Benefit Option during the public hearings on the Downtown Density Bonus Plan..
- Supported the inclusion of green roof policy and benefit education on a City of Austin website.
- Developed a proposal for green roof monitoring research.
- Advocated for an increase in Austin Energy green roof rebates.
- Developed Five-Year Policy Implementation Plan.
- Initiated a framework for green roof design considerations.
- Organized a public seminar by a green roof industry leader on green roof water retention modeling.
- Provided an outreach seminar to present GRAG's efforts and solicit public feedback.
- Integrated principles from *Water Conservation 2020: Strategic Recommendations* into green roof recommendations.
- Developed and presented the interim and final reports to selected Boards and Commissions and the City Council.

KEY FINDINGS AND CONCLUSIONS

Status of Green Roof Policy Development

Since the Green Roof Advisory Group was the first combined stakeholder and staff body sponsored by the Council to review the status of green roof policy in the City and to bring together various diverse green roof initiatives, there is no surprise that there is not a unified green roof policy across City departments. Many of our key findings and recommendations have sought to bridge this gap.

In 2007, Austin Energy coordinated a departmental and staff perspective white paper called *Growing Austin's Living Roofs*. The white paper was written in conjunction with Watershed Protection, Water Conservation and the Planning and Development Review departments. It examined the many challenges and benefits of green roofs in Austin from the perspective of staff's area of expertise. The report, updated in 2008, is provided in Appendix P. Prior to GRAG, there was no documentation of other cities' policies and programs, no overall Austin policy in support of green roofs, and no database of successfully implemented green roofs in the City.

Benefits include urban heat island mitigation, reduction of energy demand, improvement of air quality, creation of green space for social and recreational use, wildlife habitat, local food production, and stormwater attenuation.

Through our joint deliberations, we have further established within GRAG that the multiple benefits of green roofs in Austin far exceed any one benefit. Multiple benefits include urban

heat island mitigation, reduction of energy demand, improved of air quality, creation of green space for social and recreational use, wildlife habitat, local food production, and stormwater attenuation. We have also acknowledged that these benefits can be difficult to quantify. Different City departments may only address a specific benefit, making it a challenge to calculate the *cumulative* positive impacts of green roofs.

Review of other cities' green roof policies for incentives and credits, such as Portland, Chicago, and Toronto, have shown that those municipalities are far ahead of Austin in development of a robust framework to support green roofs. Through research, GRAG discovered that green roof policy development tends to follow a six phase time line:

- Phase 1: Introduction and Awareness
- Phase 2: Community Engagement
- Phase 3: Action Plan Development and Implementation
- Phase 4: Technical Research
- Phase 5: Program and Policy Development
- Phase 6: Continuous Improvement

(Source: Green Roofs: A Resource Manual for Municipal Policy Makers, excerpted in Appendix A.)

GRAG assert that Austin is in Phase 3 of policy development with the establishment of the Green Roof Advisory Group. By bringing together professionals with knowledge of green roofs all over Austin, GRAG has begun to synthesize the knowledge base. As a result, staff in the Watershed Protection Department and at Austin Energy have initiated an inventory of existing green roofs, documenting their location and various attributes.

Green Roofs in Austin's Code

Review of existing City code uncovered several existing open space credits and requirements referring to open space which may be able to be accomplished by the use of green roofs. Some of these requirements refer to Planned Unit Development (PUD) requirements, multi-family, parkland dedication, etc. Minor effort would be required to educate staff and the development community about the availability of green roofs to satisfy these requirements.

During this extensive review of code, it was determined that although green roofs are mentioned in different areas of the code, there is not one central location where a citizen can go to retrieve the information. GRAG acknowledged the need for education and advocated for a green roof web page on the City's website as a repository for all green roof information. Austin Energy's Climate Protection Program has agreed to develop the web page as a component of the existing Urban Heat Island section of the Climate Protection Program's website. This new green roof section of the website will house Austin-centric green roof information and benefits, reference specific code requirements which are satisfied by green roof infrastructure, publish monitoring data, and promote green roof construction. A complementary internal website for City Staff may also be developed.

Research and Monitoring

The Watershed Protection Department (WPD) determined the need for monitoring research, a Phase 4 activity, to document the performance of green roofs for stormwater detention prior to giving credit for green roofs. Two efforts have been initiated to close this gap. First was the review of existing water retention modeling data specific to Austin provided by a leading green roof manufacturer. Second was the funding of monitoring research at the Lady Bird Johnson Wildflower Center. In addition, results of ongoing monitoring of an Austin green roof by WPD staff will be summarized for the record.

Design and Performance Considerations

Watershed Protection Department and Austin Energy (AE) underscored the need for development of design considerations for green roofs. GRAG has embarked upon the effort of creating baseline standards, but will require more time to flesh out and finalize the design considerations discussed in this report into tangible performance standards that can be published for use by staff and the development community.

Water Conservation and Green Roofs

During the timeframe of GRAG's efforts, the Citizens Water Conservation Implementation Task Force Report to City Council, *Water Conservation 2020: Strategic Recommendations*, was published. Many of the water conservation policies presented were in alignment with policies that GRAG supports, such as use of water conserving landscape and irrigation technologies, use of non-potable water, use of greywater, and more. (See section VI, Alignment with Water Conservation 2020 Strategic Recommendations, for details.)

Green Roof Density Bonus

Also during the timeframe of GRAG's efforts, the draft *Downtown Density Bonus Plan* was presented to Council.

Through GRAG's research into different cities' green roof policies, it was revealed that density bonus incentives are the green roof incentive most often implemented.

Similarly, the green roof density bonus option was one of the benefits most often selected by the private sector in exchange for increasing entitlements. This, coupled with the fact that the hottest area of the urban heat island and the area with the most impervious cover and stormwater runoff is the downtown core, led GRAG to recommend that green roofs be one of the individual Public Benefit Options in the Density Bonus Plan. While one position is that green roofs are optional in the Gatekeeper Sustainability requirement, GRAG believes that there is not enough incentive present unless green roofs are a separate, standalone option for selection.

Green Roofs on City Buildings

While reviewing the charge of the GRAG with various City departments, many City personnel were unaware the Austin City Hall had a green roof that was designed as an environmental education model and had been nationally recognized as an exemplary green roof project. It was clear that more green roof education should be provided to City staff, the

City Hall green roof performance should be monitored and documented, and the City Hall green roof should be used as a model to educate the public about the benefits of green roofs.

With the success of the City Hall project, the Public Works Department (PW) is investigating the potential of green roofs for any new City building projects. In particular, GRAG supports the inclusion of at least one additional green roof to the City's portfolio in the next five years.

Outreach and Education

As GRAG assessed the state of green roofs in Austin, it became evident that continued outreach and education were important to the progress of promoting and implementing green roofs. While the website will move green roofs forward, there is need to provide a more focused outreach effort to various organizations and entities. This effort is not the charge of GRAG, but individuals and organizations represented by its members could certainly continue to provide seminars, green roof tours, and other forms of publicity.

NEXT STEPS

Five-Year Policy Implementation Plan

Once GRAG identified the need for various green roof activities which obviously could not be accomplished in one year, GRAG set out to develop a Five-Year Policy Implementation Plan. Staff worked with various City departments to create reasonable goals for each year which cumulatively ensure that green roofs would remain on the policy and program agenda and budget. (See section VII. Next Steps for the Five-Year Policy Implementation Plan, also represented graphically in Appendix B.)

The Five-Year Policy Implementation Plan was developed to systematically support the increased use of green roofs in Austin.

The primary basis for the Five-Year Plan was the Policy and Incentives Matrix (see section VII. Next Steps), developed by staff, which reviewed a wide range of options to offer credits, incentives, and other measures to encourage the use of green roofs in Austin. These options ranged from potential changes specific to Austin's regulatory system to measures used by other cities across the world. The GRAG and staff worked to identify the most feasible and productive of these options. Staff also met with targeted City departments to solicit staff input and recommendations for measure. The GRAG and support staff then developed a Five-Year Plan to carry out the most important measures, with the five-year period beginning in October 2010. Policy options were prioritized in years one through five according to their ease of execution and their critical-path nature for the development of future program elements.

Request for GRAG Extension

The Green Roof Advisory Group requests a one year extension to initiate the implementation of the group's recommendations outlined in the Five-Year Plan and to provide a solid basis for ongoing policy development.

The existing, mutually supportive relationship between city staff and GRAG stakeholder members is an important key to assisting the City in implementation of green roof policy goals.

All parties recognize the need for continued GRAG and other green roof stakeholder activities to complement future staff efforts and most effectively promote green roofs in the City. The critical need for the establishment of green roof design considerations—performance based criteria for successful green roofs—was identified. The development of the design considerations, however, is a substantial undertaking and was not possible to accomplish within the one-year timeframe allotted by Council for GRAG activity. Therefore, the task was pushed forward into Year 1 of the Implementation Plan. Additional Year 1 stakeholder tasks include support for staff educational activities, continued advocacy for green roofs as a density bonus public benefit option, assessment of green roof monitoring research, and progress review of policy recommendations for incentives and credits.

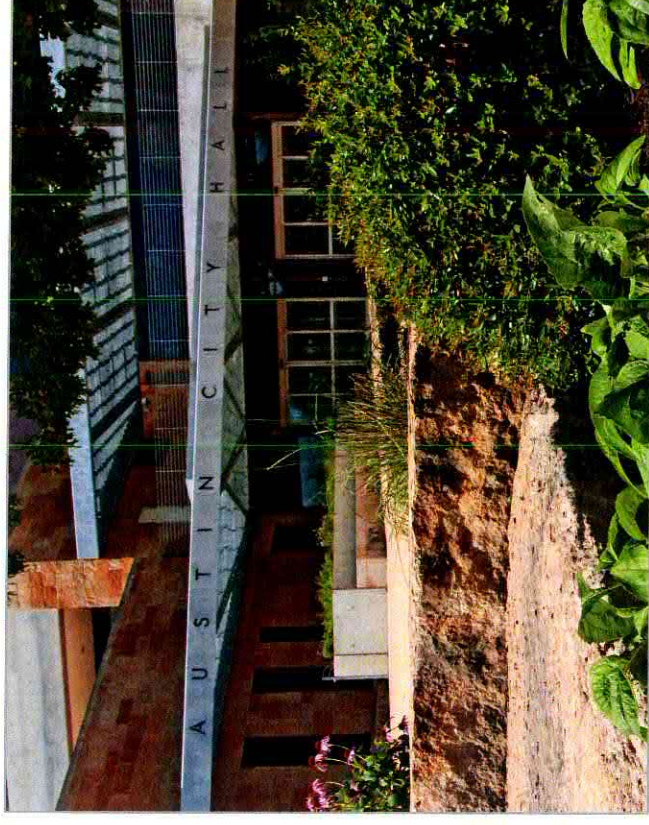
AUSTIN CITY HALL

Location: Downtown Austin

Project Type: Institutional

Year Installed: 2005

Description: The Austin City Hall Green Roof is comprised of two publicly accessible green roof systems: the first is a plaza on top of underground parking, the second is a terrace over occupied space. Construction is cast-in-place concrete. Maintenance is contracted at once per week.



Photos courtesy of M. Knox, R. Manning, E. Jarger, A. Wong

Awards: Green Roof Award of Excellence from Green Roofs for Healthy Cities in 2008 for the Intensive Institutional Category; Certificate of Exceptional Merit from National Wildlife Federation; 1st LEED Gold Project in Austin

Green roof area: Over parking garage: 11,145 sq. ft.;

Over occupied space: 2,480 sq. ft.

Green roof type: Intensive, monolithic, 3 feet of soil depth
Reason for green roof: Sustainability, educational model, wildlife habitat, aesthetic, amenity

Green roof components: Garden Roof Assembly, American Hydrotech

Vegetation: Native trees, shrubs, and groundcover

Water Use: Efficient irrigation technologies such as stream bubblers and drip irrigation to minimize water use by applying water directly at the plant roots. No potable water was used due to the availability of ground water as the source.

Amenities: Waterfall uses HVAC condensation

Lessons Learned: Construction scheduling issues need thorough review and coordination; Maintenance needs to be tailored to green roof considerations

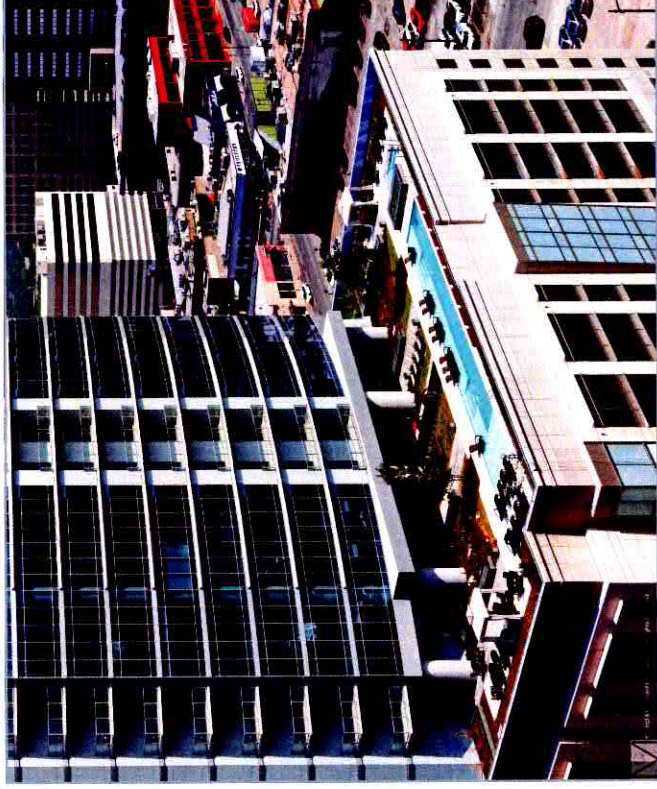
AUSTONIAN CONDOMINIUMS

Location: Downtown Austin

Project Type: High-rise residential condominium

Year Installed: 2010

Description: The Austonian green roof is a privately accessible terrace serving as a backyard for residents of the building. The terrace offers a place to relax, cook, entertain and swim. The terrace is more than 12,000 square feet in size. It sits on the top of the building's ten-story pedestal. Construction is cast-in-place concrete.



Photos courtesy of Thomas McConnell

Green roof area: 6,420 square feet

Green roof type: Extensive, monolithic, 4 – 7 inches soil depth (616 square feet) and intensive, monolithic, 16 – 18 inches soil depth (5,804 square feet) with two tree wells 5 feet deep.

Reason for green roof: Aesthetic, amenity, reduce ambient temperature

Green roof components: Garden Roof Assembly, American Hydrotech

Vegetation: Over 65 native and adaptive drought-tolerant plants including two clusters of Red Oak trees, ground cover, lawn, shrubs, and an herb garden.

Water Use: Pressurized irrigation system using HVAC condensation collected in eight 1,600 gallon tanks.

Amenities: Pool, fountain, cooking area, dog park, passive gathering spaces.

Lessons Learned: Sun / shade modeling and calculating solar reflectivity from adjacent tower glazing systems are important to determine appropriate plant species and location. Garden will be monitored during the first year and modified accordingly to assess plant growth and reflectivity throughout the year. Future high-rise development may affect the sun / shade aspect of the garden and its microclimate requiring modifications to plant types and locations.

DELL CHILDREN'S MEDICAL CENTER of CENTRAL TEXAS

Location: North Central Austin

Project Type: Institutional

Year Installed: 2007

Description: The Dell Children's Medical Center site houses two publicly accessible green roofs: a 3,950 sq. ft. Conference Center Garden and a 7,015 sq. ft. garden serving the Chapel, Inpatient Therapy, Patient, Board room and balcony. Roof membrane construction is poured-in-place concrete over high-density rigid foam.



Photos courtesy of TBG Partners

Awards: 1st LEED Platinum hospital in the world

Green roof Area: 10,965 square feet

Green roof type: Intensive, monolithic, 18 inch soil depth

Reason for green roof: Sustainable design principles, aesthetics, addition of an accessible amenity, provide comforting natural area for patients

Green roof components: Garden Roof Assembly, American Hydrotech

Vegetation: Native and adapted drought-tolerant plants

Water Use: Irrigation with City of Austin reclaimed water

Amenities: Outdoor courtyards

Lessons Learned: Increased soil depth for greater moisture holding capacity; Plant loss due to shading by tall buildings and from reflection of heat from windows into courtyards; Owner commitment to ongoing maintenance is important to successful ongoing performance

HILL COUNTRY RESIDENCE

Location: Southwest Austin

Project Type: Residence

Year Installed: 2005

Description: Residential green roof to serve as an outdoor room that would help restore disrupted ecosystem services, offer views of the hill country, create habitat and beauty, be an extension of the prairie grass meadow on the property, and require little to no maintenance.



Photos provided by Kathy Zarsky

Green roof Area: 1,125 square feet

Green roof type: Monolithic, extensive to semi-intensive, 6-8 inches soil depth

Reason for green roof: Aesthetic, ecological, amenity, thermal insulation

Green roof components: American Hydrotech system. Soil media locally formulated and supplied.

Vegetation: Native drought-tolerant plants

Water use: No irrigation, hose bib for infrequent hand watering

Amenities: Small stone paver patio

Lesson Learned: A green roof can be a very low-maintenance landscape if plants are allowed to come into their own balance and evolve without much interference. The overall assembly selected, as well as plants, has everything to do with the owner's expectations, budget, sustainability objectives, etc. Careful attention to flashing details should be thought through, regardless of roof type and expectations, as metals will leach.

Stormwater runoff from roof is higher in nutrients than undeveloped land and should be directed to ground level vegetation rather than allowed to discharge directly into creeks. (Stormwater runoff quality and quantity of this roof is currently monitored by City of Austin.)

ESCARPMENT VILLAGE

Location: Southwest Austin
Project Type: Retail Center
Year Installed: 2005



2005

Description: First publicly visible green roof to be installed in Austin for a retail center striving for the latest technologies in green building. The green roof provides a view from the mezzanine level of the coffee shop seating area.

Green roof area: 8,000 sq. ft.

Green roof type: semi-intensive, modular tray system, 6 inch soil depth

Reason for green roof: sustainability, energy savings, aesthetic amenity

Green roof components: Weston Solutions Green Grid System



2010

Vegetation: Native grasses and shrubs and other plants

Water use: Spray irrigation system using potable water

Amenities: enhanced view (roof is not accessible)

Lessons Learned: A modular tray system was chosen to minimize difficulty of roof maintenance and repair. However, the modular system proved unsuitable for the Central Texas climate. (Monolithic systems have proved to be successful.) A problematic spray irrigation system contributed to nutrient rich potable water runoff.

Maintenance by a party knowledgeable of green roof best practices is an important step to improved understanding of ways to improve plant health and minimize nutrient water use and nutrient export.